19. Explain the molecular orbital theory of UV spectra. Write down in detail the various applications of UV spectroscopy.

20. Describe magnetic properties of Nuclei and hence define nuclear magneton. Deduce resonance condition

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NOVEMBER/DECEMBER 2023

DPH41 — SPECTROSCOPY

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Diatomic molecules such as CO, HF will show a rotational spectrum, whereas homonuclear diatomic molecules such as H_2, N_2 will not. Why?

2. List four applications of microwave spectroscopy.

3. What is the principle of IR spectroscopy?

4. What are hot bonds? Why are they called so?

5. List few applications of Raman spectroscopy.

6. Outline the advantages of SERS over normal Raman scattering?

7. How is UV absorbance measured?

8. Mention the wavelength range of UV spectroscopy?

9. How does Atomic Absorption Spectroscopy work?

10. What is the purpose of the Mossbauer spectrometer?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Analyze the effect of isotopes in rotational spectra.

Or

(b) Explain the rotation spectra of non-rigid rotator.

12. (a) Determine the vibrational energy of a diatomic molecule.

Or

(b) Interpret vibrational spectra for H_2O molecules.

13. (a) Compare IR and Raman spectroscopy.

Or

(b) Explain the classical theory of Raman scattering.

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14. (a) Discuss different types of absorption bands.

Or

(b) Explain the selection rules in UV spectroscopy.

15. (a) Discuss the ESR spectrum of Hydrogen atom.

Or

(b) List the applications of Mossbauer and Atomic Absorption spectroscopy.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain the Stark effect in studying the rotational spectra. What is the importance of Stark effect studies?

17. Explain the construction and working principle of IR spectrometer. Mention the advantages of ATR technique.

18. How can one determine the structure of a molecule using IR and Raman spectroscopy? Explain.